



DEPARTMENT OF PUBLIC UTILITIES

DEVELOPMENT STANDARDS AND REQUIREMENTS FOR STORM WATER

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These development requirements are as of July 15, 2015 and are subject to change.

The following is a list of typical Public Utility development requirements for the storm water portion. Some of the items may not apply. Additional requirements may be applied depending on the location of the property. The developer shall be required to submit utility drawings (24"X36") for review and approval. Drawings shall include all information as required in the Preliminary Letter.

It is anticipated that when all requirements of the Public Utilities Department have been met, a Public Utilities Final Approval Letter will be issued. Signing by the developer or his/her representative will be required. A drawing/drawings, signed, as approved by the City and the developer shall be issued for use by the developer and his contractor. Signing of the Public Utilities Final Approval letter, payment of fees, and posting of a bond must be completed prior to beginning construction work on the site.

STORM WATER:

1) Design/Drawings

- a) All drawings and calculations shall be *stamped, signed, and dated* by an engineer, licensed to practice in the State of Utah for the final submittal.
- b) It is required that the intensities used in the Storm Water Master Plan be used in the calculation of storm water runoff. The type of storm required is indicated below. Depth-duration-frequency tables for different types of storms, based on the Storm Water Master Plan, are enclosed. *Please note that rainfall intensities are to be adjusted based on the mean elevation of the site.*
- c) Indicate on the drawings the routing of storm runoff for a 100-year, 72-hour storm to determine where the flood would go if the rainfall intensities are greater than the 10-year storm. Provide a 100-year, 72-hour calculations for runoff in cfs. Storm runoff shall not be allowed to run onto neighboring properties (unless an easement allowing such can be obtained) or to reach the buildings on this site.
- d) The following note shall be added to the subdivision plat: "No driveway shall be constructed so as to convey storm runoff toward any building."
- e) Show on the drawings the location of all existing utility lines, and provide adequate

separation to satisfy the requirements of the utility line owners.

- f) Indicate on the drawings the size, slope and material of all *existing and proposed* pipes. All storm water pipes 12" or larger shall be RCP. For smaller diameter pipes, PVC SDR 35 may be used. All pipes that are to be maintained by Sandy City should have a minimum diameter of 15". All pipes that connect directly to Sandy City's system must have a minimum diameter of 15". All pipes should have a minimum cover of 12" to top of pipe bell. Pipes should have sufficient slope to produce a minimum velocity of 3 fps. A minimum slope of 0.50% is required.
- g) A maximum of 300 linear feet is allowed between clean out manholes.
- h) Typically, a maximum of 600 linear feet is allowed between curb inlet boxes in roadways. Provide calculations for storm runoff flow, time of concentration, and gutter flow spread. Provide recommendation criteria/justification for proposed locations of curb inlet boxes. Provide calculations indicating the capacity of the inlet boxes.
- i) Indicate on the drawings all top of lid/grate and flow line elevations for all *existing and proposed* drainage structures.
- j) All drainage structures shall conform to Sandy City Standard Specifications and Details for Municipal Construction. Indicate on the drawings the Sandy City detail number for each box. Unless there is a special reason to do otherwise, all curb inlet boxes should be called out as standard detail SW-02 and SW-03 on the construction drawings. Combo boxes should be called out as standard detail SW-04A and SW-04B. Junction boxes should be called-out on the drawings as SW-05A and SW-05B. **A combination box should be used any time there are two or more pipes connecting to the same box where an inlet is proposed. Junction boxes are required on all junctions in both private and public storm water systems.**
- k) If this project includes a flood plain, the existing flood plain area should be shown according to the FEMA flood plain maps.
- l) An erosion and sediment control plan for both during and after construction (Storm Water Pollution Prevention Plan) shall be prepared and submitted with plans for approval. This plan shall meet the requirements of the Jordan Valley Municipalities Permit (Permit UTS000001) and the Utah General Construction Permit (Permit UTRC00000) for projects that warrant compliance with the Utah General Construction Permit (UGCP) regulation.
- m) Development design shall consider and address requirements specified in following sections including General Requirements, Detention/Retention, Storm Water Treatment, Irrigation Facilities, Low Impact Development, Storm Water Pollution Prevention Plan and Notice of Intent, Best Management Practices, Construction, Post-Construction Storm Water Maintenance Plan and Agreement, and Notice of Termination. Additional design requirements may applied for the project.

2) General Requirements

- a) The developer will be required to grant to the City a 20' wide storm water easement (10' either side of pipe) for all storm water and around manhole that is being maintained by the City and is being installed on private property. Easement shall be on a signed standard easement form. Typically, this is done after all the waterlines have been installed and before the 90% Bond release.
- b) Submit signed easements for all existing or new storm water lines that pass through the property for this development and are maintained by Sandy City. Typically, an easement width of twenty feet, centered on the storm water or irrigation pipe, is required. The language in the easements should be approved by Sandy City prior to obtaining signatures. Required easement form can be obtain by calling reviewing engineer at the number listed at the beginning of this document.
- c) A pre-construction meeting is required once Final Approval has been granted. This is where the developer/owner and the contractor meet with the City's inspectors to review the approved plans. The pre-construction meeting shall be scheduled through the Planning Department.
- d) Developer agrees that any existing storm water facilities (lines, manholes, detention pond, etc.) which are found to not meet current City standards or to be adversely affected by the development during construction, necessitating them to be upgraded, moved or otherwise altered to facilitate maintenance (as determined by the City), shall be the developer's responsibility at no cost to the City.
- e) **If this project adjoins the East Jordan Canal / Jordan and Salt Lake Canal right-of-way, the developer should obtain a letter of approval from Salt Lake City Public Utilities, a copy of which should be submitted to Sandy City Public Utilities. The developer should first send a copy of the site plans, along with the enclosed Memorandum, to Salt Lake City Public Utilities. It is recommended that this process be started as soon as possible so as not to delay the construction of the project.**
- f) **If the storm drain system connects to a County Storm Drain System, the developer should submit a letter, giving approval to connect to the storm water facilities, from Salt Lake County. It is recommended that this process be started as soon as possible so as not to delay the construction of the project.**
- g) **If the storm drain system connects to UDOT Storm Drain System, the developer should submit a letter, giving approval to connect to the storm water facilities from U.D.O.T. It is recommended that this process be started as soon as possible so as not to delay the construction of the project.**
- h) Additional requirements may be applied for the project.

3) Detention/Retention

- a) There are three options to detention:
 - i) Option 1: It is likely that detention of storm water runoff will be required. Storm water outflow from the site will need to be restricted to 0.2 cfs/acre unless otherwise written in the Preliminary Letter. The capacity of the downstream flood control system piping shall be checked using the Mannings formula or hydraulic grade line calculations. Calculations should be based on a 10-year, 3-hour storm. **The developer shall submit those findings to Sandy City Public Utilities.** With the help of the above findings, the rate of allowable discharge from the site will be determined by Sandy City Public Utilities. Based on that discharge rate, the developer should provide calculations showing storm water detention volume requirements for a 10-year, 3-hour storm, using the rational method.
 - ii) Option 2: Detention of storm water runoff is required. The developer should provide calculations showing storm water detention volume requirements for a 10-year, 3-hour storm, using the rational method (see attached Rainfall Intensity Table), with storm water outflow from the site restricted to 0.2 cfs/acre unless otherwise written in the Preliminary Letter.
 - iii) Option 3: Detention of storm water runoff is required. Because this project is in a Sensitive Overlay Area, the developer should provide calculations showing storm water detention volume requirements for a 25-year, 3-hour storm, using the rational method (see attached Rainfall Intensity Table), with storm water outflow from the site restricted to 0.2 cfs/acre unless otherwise written in the Preliminary Letter.
- b) Show detention ponds, including the maximum water surface perimeter line and maximum water surface elevation. The pond perimeter line and surface elevation should be based on the finish grades in the pond area. Detention ponds in driving and parking areas should be no deeper than 12" at peak detention. We recommend that an overflow be provided for storm water runoff accumulations beyond the 10-year storm to avoid deep ponding in parking areas. The developer should work with the Planning Department on this issue. Detention pond must either be grass or concrete. Access to the pond shall be provided for maintenance.
- c) The developer should provide calculations showing the basis for the size of the restrictive orifice. In calculating the orifice size, use a head equal to the distance from the maximum water surface elevation to the center of the orifice. We recommend that the orifice be on the outlet pipe so that sedimentation and debris is less likely to plug the orifice. A 2" diameter orifice is the smallest size required. If a 2" diameter orifice results in a discharge of more than 0.2 cfs/acre, it is permissible to consider the greater discharge rate in the calculation of storm water detention volume.
- d) Indicate on the drawings, in a "call-out", or by means of a detail, the location (which

box and location relative to outlet pipe opening) where the restrictive orifice plate is to be installed (“Orifice is to be on the bottom of the pipe outlet”) as well as the size of the orifice to the nearest 1/8 inch.

- e) If there are no usable storm water facilities in the area, retention of storm water runoff is required. Sandy City has a Drinking Water Source Protection ordinance, and generally, retention ponds and sumps are not permitted, especially if the project falls within the primary recharge zone. **However, if there are no other options**, retention ponds and sumps may be approved. As part of the approval, the following items should be done:
 - i) The developer should contact the reviewing engineer requesting a letter of approval for the retention pond and/or sump. **It is recommended that the reviewing engineer be contacted immediately to review this issue.**
 - ii) *Typically, a sump qualifies as an injection well.* The developer should submit a “Utah Underground Injection Control Program Inventory Information” form to the State Department of Environmental Quality, Division of Water Quality, Ground Water Protection Section to receive authorization by rule. The developer or his engineer should contact the State if there are any questions. The State will review the Inventory form and determine whether a permit is required. **It is recommended that this Inventory form be submitted immediately.**
 - iii) The developer should submit a soils test report, stamped, signed and dated by a soils engineer, indicating soils types and depths, ground water depth (should be below sump floor and/or retention pond bottom elevation) and soil permeability rate.
 - iv) The permeability rate of the soil may be used as a discharge rate.
 - v) The developer should provide calculations showing retention volume requirements for a 100-year, 72-hour storm.
 - vi) Any existing sump must be replaced with a new sump, or it must be shown and accepted that the existing sump is adequate.
 - vii) The developer should submit plans and details of the sump design. **If gravel is used in the sump, 1 ½ – 2” (min.) gravel should be specified, with a maximum void ratio of 40%.**
 - viii) Show retention ponds, including the maximum water surface perimeter line and maximum water surface elevation. The pond perimeter line and surface elevation should be based on the finish grades in the pond area. Retention ponds in driving and parking areas should be no deeper than 12” at peak retention. We recommend

that an overflow be provided for storm water runoff accumulations beyond the 10-year storm to avoid deep ponding in parking areas.

- f) For each residential lot: Each lot is required to retain all the storm water on site based on the 10 year-3 hour storm. This could be accomplished by use of swales, retention areas, etc. Percolation into the ground may be allowed. A percolation test would be required.

4) Storm Water Treatment

- a) Prior to discharging storm water, it must be treated to reduce illicit discharges of sediment, oils, floatables and other pollutants. The treatment method must be approved by the City.
- b) The last clean out or inlet box on the site, prior to connecting to the city-maintained storm water system, shall have a sand trap equal in depth to the diameter of the outlet pipe.
- c) Oil Water Separator
 - i) **Oil oil/water separator is required prior to discharge into any storm water system. The oil/water separator should be designed so that the flows during the first 15 minutes of a 2 year, 1-hour storm will be allowed to stay in the detention pond/holding area of the separator for a time sufficient for 98% of the oil to rise above the outlet side of the central chamber in the separator. In calculating the size of the separator, the following factors are recommended: 1) the oil has a specific gravity of 0.89, 2) the runoff water has a temperature of 50 degrees Fahrenheit, 3) the oil entering the separator has a concentration of 400 p.p.m., and the allowable concentration of oil leaving the separator has a concentration of 10 p.p.m. (98%), 5) the rainfall intensity to use is based on the 10-year, 3-hour storm intensities, 6) assume a terminal rise rate of 0.00055 ft/s.**
 - ii) The separator should be designed with a bypass to allow the higher flows beyond the first 15 minutes to flow outside the separator without flushing the separator out.
 - iii) It is noted that the above formula for sizing the oil/water separator is based on a simple, three/chamber oil/water separator. If the developer desires to submit other products and designs, technical information about the separator, how it works and how it is sized, should be submitted for review.

5) Irrigation Facilities

- a) The developer is required to provide a continuance of appropriate irrigation facilities

for irrigation water users who historically have relied upon facilities on or crossing through the project site, including any needs that may become apparent during or after construction of the project. The design and construction of any irrigation facilities should be approved by any down-stream users, the irrigation company, and by Sandy City Public Utilities.

- b) Show all existing irrigation ditches and pipes on and adjacent to the property, with pipe sizes, and flow line and top of box elevations.
- c) Irrigation easements of record are to be shown on the drawings. If there is no irrigation easements of record for an existing irrigation facility, an easement must be provided. Contact the irrigation facility owner to determine the required width.
- d) It is required that all existing irrigation canal, ditch or pipe that is maintained by Sandy City be replaced with RCP. Drawings should include details for irrigation boxes, head walls, head gates and grates. Size pipe to handle the existing flow requirements. Contact Ted Ketten, Sandy City Public Utilities, (801) 352-4407, for additional information about these requirements.
- e) There may be existing irrigation facilities which potentially could be abandoned. However, it is the developer's responsibility to do any research necessary to make that determination.
- f) Submit irrigation facility design drawings to Sandy City and the ditch owners/users for approval. A letter must be obtained from the irrigation facility owner(s) and user(s) (approving the plans) and submitted to Sandy City Public Utilities.

6) Low Impact Development (LID)

- a) As part of the Jordan Valley Municipalities Permit, the City encourages an LID approach, which includes the implementation of structural BMPs, where practicable, that infiltrate, evapotranspire or harvest and use storm water for the site to protect water quality.
- b) All development that warrants compliance with the UGCP regulation, must include an LID analysis that meets the objective of mirroring the predevelopment hydrology. No LID limits are defined except designs must not negatively impact surrounding properties. The analysis must identify LID options considered and list the reasons why it will be incorporated or why the considered LIDs are not practical for the site use or conditions. Submit a report with storm water calculations that summarizes the analysis and results.
- c) Suggested LIDs include:
 - i) Reduce the amount of impervious area.

- ii) Reduce the amount of surface that drains to right of way (slope private and public residential property away from right of way).
- iii) Connect roof drains to landscaping.
- iv) Slope dumpster enclosure pads towards landscaping.
- v) Minimize concentrating runoff. Distribute runoff to multiple sumps or direct runoff to wide open fields facilitating infiltration and evaporation and minimizing the depth of standing water,
- vi) LID design has few limits but the selected LID must be defined and maintained via the requirements of the Post-Construction Storm Water Maintenance Plan and Agreement.
- vii) Retention/ infiltration designs shall include systems that minimize above ground standing water and mosquito hazards.

7) Storm Water Pollution Prevention Plan (SWPPP) and Notice of Intent (NOI)

- a) For all projects that warrant compliance with the Utah General Construction Permit (UGCP) regulation, an NOI must be submitted to the Utah State Division of Water Quality. This applies to projects that disturb one acre or more or that are part of a larger common plan of development that affects one acre or more.
- b) A SWPPP is required to be submitted for all projects as identified in the Sandy City Land Development Code (LDC) Chapters 15A-15 (Sensitive Areas Overlay Zone), 15A-20 (Residential), 15A-23 (Commercial/Industrial) and Title 13 – Streets and Public Improvements.
- c) Projects that warrant compliance with the UGCP regulation are required to use the State template, in order to satisfy state regulation. The template is also necessary to create an environment of manageability and equality among all permit applicants.
- d) For projects that warrant compliance with the UGCP, the SWPPP shall be managed via an internet-based management system per the LDC Chapters 15A-15, 15A-20, and 15A-23.

8) Best Management Practices (BMPs)

- a) The City adopts as its BMP manuals the following publications:
 - i) Salt Lake County Public Works Department “Guidance Document for Storm Water Management”
 - ii) Salt Lake Valley Health Department Storm Water Regulations

- iii) Jordan River Commission “Best Practices for Riverfront Communities”
- iv) Utah DEQ’s Top Ten BMPs for Construction Sites
- v) EPA’s Construction Site Storm Water Runoff Control website
- b) These manuals include lists of acceptable BMPs and specific design performance criteria and operation and maintenance requirements for each storm water practice. The manuals may be updated and expanded from time to time, at the discretion of the governing body of the City, based on improvements in engineering, science, monitory and local maintenance experience.

9) Construction

- a) Construction work shall be conducted in accordance with SWPPP and/or NOI requirements.
- b) Inspections shall be completed per the requirements of the SWPPP and/or NOI. All inspections shall be documented and made available via the online SWPPP management system.
- c) Regular review of the online SWPPP management system and inspections will be completed by the Public Utilities Department to confirm that construction work is being performed in accordance with SWPPP, NOI, and UGCP requirements. Review and inspection reports completed by the Sandy City Public Utilities Department will be provided to the Contractor which are to be posted to the online SWPPP management system. All identified violations are to be addressed and documented on the online SWPPP management system.

10) Post-Construction Storm Water Maintenance Plan and Agreement

- a) The purpose of the Post-Construction Storm Water Maintenance Plan and Agreement is to control storm water runoff and reduce pollutants in storm water runoff after construction is complete and the developed site is in operation. This is achieved by accomplishing the following:
 - i) Controlling erosion
 - ii) Controlling discharge of sediment into storm water drainage facilities or off-site
 - iii) Preventing illicit discharges into on-site soils, storm drainage facilities or off-site
 - iv) Prevention of debris and garbage from entering the storm water system
- b) A Post-Construction Storm Water Maintenance Plan must be prepared and submitted with the plans for approval for all privately owned or maintained facilities that warrant

compliance with the UGCP regulation. The plan shall be contained on a plan sheet of its own, rather than being a part of another plan sheet, and is to contain at least the following:

- i) The site plan, including vicinity map, proposed contours, permanent storm water features, and landscaping.
- ii) BMPs to accomplish the purpose of the plan. Examples of appropriate BMPs may include those addressing operation and maintenance of storm drainage quality control facilities, operation and maintenance of storm water discharge control facilities, maintenance of landscaping, good housekeeping practices, etc.
- iii) Showing the following for each BMP specified:
 - (1) Location and extent of specified BMPs, as appropriate
 - (2) Detailed schedule of execution for each specified BMP, in terms of starting time, duration, frequency, etc., as appropriate
 - (3) Any information in addition to or different from that shown on the BMP fact sheets as necessary to employ the BMPs on the site
- iv) BMP fact sheets or other descriptive material for all specified BMPs
- v) The following statement shall prominently appear on the Post-Construction Storm Water Maintenance Plan:

“The holders of the business license at this site (or owner of the lot if there is no business license) are responsible to perpetually follow this Post-Construction Storm Water Maintenance Plan. Failure to follow the plan may result in the City refusing to renew business licenses or take other action against the property owner.

The objectives of the Plan are to:

- 1. Control soil erosion
- 2. Control discharge of sediment into storm drainage facilities or off-site
- 3. Prevent illicit discharges into on-site soils, storm drainage facilities or off-site
- 4. Prevent debris and garbage from entering the storm water system

If the objectives of the Plan are not being met, the site operator or owner shall make adjustments to the Plan as needed to accomplish its purposes. Sandy City encourages adjustments to the plan that enhance effective storm water management. However, significant reduction of practices contained in the Plan is to be accomplished through formal modification of the plan and resubmission to the City for approval.”

- vi) The following Certification Statement must also be included, signed and dated:

“I CERTIFY UNDER PENALTY OF LAW THAT THIS DOCUMENT AND ALL ATTACHMENTS WERE PREPARED UNDER MY DIRECTION OR SUPERVISION IN ACCORDANCE WITH A SYSTEM DESIGNED TO ASSURE THAT QUALIFIED PERSONNEL GATHERED AND EVALUATED THE INFORMATION SUBMITTED. BASED ON MY INQUIRY OF THE PERSON OR PERSONS WHO MANAGE THE SYSTEM, OR THOSE PERSONS DIRECTLY RESPONSIBLE FOR GATHERING THE INFORMATION, THE INFORMATION SUBMITTED IS, TO THE BEST OF MY KNOWLEDGE AND BELIEF, TRUE, ACCURATE, AND COMPLETE.

I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT FOR KNOWING VIOLATIONS.”

- c) The owner of development that warrants compliance with the UGCP regulation, must submit a signed Storm Water Maintenance Agreement using the Sandy City Agreement template. The Post-Construction Maintenance Agreement needs to be recorded at the Salt Lake County Recorder’s Office per the requirements in the LDC.

11) Notice of Termination (NOT)

- a) Once the site is stabilized and inspected by Sandy City Public Utilities Department, the site operator must submit a NOT to the Utah State Division of Water Quality for projects that warrant compliance with the UGCP regulation. For projects that do not warrant compliance with the UGCP regulation, the site operator must submit a NOT to the Sandy City Public Utilities Department.

If you have any questions with these requirement, please contact Chaleurn “Lennie” Chanthaphuang, P.E. at 801-568-7293.

10-YEAR, THREE-HOUR STORM: RAINFALL INTENSITIES (INCHES PER HOUR) ADJUSTED FOR ELEVATION

ADJUST. FACTOR		0.94	0.96	0.98	1	1.03	1.06	1.09	1.12	1.15	1.18	1.2	1.19	1.17	1.16	1.14	1.13	1.11	1.1
ELEV.		4300	4400	4500	4600	4700	4800	4900	5000	5100	5200	5300	5400	5500	5600	5700	5800	5900	6000
TIME (MIN.)	STANDARD INTENSITY	INTENSITY-INCHES PER HOUR (ADJUSTED)																	
5	3.72	3.50	3.57	3.65	3.72	3.83	3.94	4.05	4.17	4.28	4.39	4.46	4.43	4.35	4.32	4.24	4.20	4.13	4.09
15	2.28	2.14	2.19	2.23	2.28	2.35	2.42	2.49	2.55	2.62	2.69	2.74	2.71	2.67	2.64	2.60	2.58	2.53	2.51
30	1.44	1.35	1.38	1.41	1.44	1.48	1.53	1.57	1.61	1.66	1.70	1.73	1.71	1.68	1.67	1.64	1.63	1.60	1.58
45	1.15	1.08	1.10	1.13	1.15	1.18	1.22	1.25	1.29	1.32	1.36	1.38	1.37	1.35	1.33	1.31	1.30	1.28	1.27
60	0.93	0.87	0.89	0.91	0.93	0.96	0.99	1.01	1.04	1.07	1.10	1.12	1.11	1.09	1.08	1.06	1.05	1.03	1.02
90	0.69	0.65	0.66	0.68	0.69	0.71	0.73	0.75	0.77	0.79	0.81	0.83	0.82	0.81	0.80	0.79	0.78	0.77	0.76
120	0.55	0.52	0.53	0.54	0.55	0.57	0.58	0.60	0.62	0.63	0.65	0.66	0.65	0.64	0.64	0.63	0.62	0.61	0.61
180	0.40	0.38	0.38	0.39	0.40	0.41	0.42	0.44	0.45	0.46	0.47	0.48	0.48	0.47	0.46	0.46	0.45	0.44	0.44
360	0.25	0.24	0.24	0.25	0.25	0.26	0.27	0.27	0.28	0.29	0.30	0.30	0.30	0.29	0.29	0.29	0.28	0.28	0.28
720	0.15	0.14	0.14	0.15	0.15	0.15	0.16	0.16	0.17	0.17	0.18	0.18	0.18	0.18	0.17	0.17	0.17	0.17	0.17
1440	0.09	0.08	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.10	0.10	0.10	0.10	0.10

25-YEAR, 3-HOUR STORM: RAINFALL INTENSITIES (INCHES PER HOUR) ADJUSTED FOR ELEVATION

ADJUST. FACTOR		0.92	0.95	0.98	1	1.04	1.08	1.12	1.16	1.19	1.22	1.25	1.23	1.21	1.18	1.16	1.14	1.12	1.1
ELEV.		4300	4400	4500	4600	4700	4800	4900	5000	5100	5200	5300	5400	5500	5600	5700	5800	5900	6000
TIME (MIN.)	STANDARD INTENSITY	INTENSITY-INCHES PER HOUR (ADJUSTED)																	
5	4.92	4.53	4.67	4.82	4.92	5.12	5.31	5.51	5.71	5.85	6.00	6.15	6.05	5.95	5.81	5.71	5.61	5.51	5.41
15	3.04	2.80	2.89	2.98	3.04	3.16	3.28	3.40	3.53	3.62	3.71	3.80	3.74	3.68	3.59	3.53	3.47	3.40	3.34
30	1.92	1.77	1.82	1.88	1.92	2.00	2.07	2.15	2.23	2.28	2.34	2.40	2.36	2.32	2.27	2.23	2.19	2.15	2.11
45	1.50	1.38	1.43	1.47	1.50	1.56	1.62	1.68	1.74	1.79	1.83	1.88	1.85	1.82	1.77	1.74	1.71	1.68	1.65
60	1.25	1.15	1.19	1.23	1.25	1.30	1.35	1.40	1.45	1.49	1.53	1.56	1.54	1.51	1.48	1.45	1.43	1.40	1.38
90	0.9	0.83	0.86	0.88	0.90	0.94	0.97	1.01	1.04	1.07	1.10	1.13	1.11	1.09	1.06	1.04	1.03	1.01	0.99
120	0.72	0.66	0.68	0.71	0.72	0.75	0.78	0.81	0.84	0.86	0.88	0.90	0.89	0.87	0.85	0.84	0.82	0.81	0.79
180	0.54	0.50	0.51	0.53	0.54	0.56	0.58	0.60	0.63	0.64	0.66	0.68	0.66	0.65	0.64	0.63	0.62	0.60	0.59
360	0.33	0.30	0.31	0.32	0.33	0.34	0.36	0.37	0.38	0.39	0.40	0.41	0.41	0.40	0.39	0.38	0.38	0.37	0.36
720	0.19	0.17	0.18	0.19	0.19	0.20	0.21	0.21	0.22	0.23	0.23	0.24	0.23	0.23	0.22	0.22	0.22	0.21	0.21
1440	0.12	0.11	0.11	0.12	0.12	0.12	0.13	0.13	0.14	0.14	0.15	0.15	0.15	0.15	0.14	0.14	0.14	0.13	0.13

100-YEAR, 72-HOUR STORM: RAINFALL INTENSITIES (INCHES PER HOUR) ADJUSTED FOR ELEVATION

ADJUST. FACTOR FOR TIMES: 5 - 180 MINUTES		0.90	0.933	0.966	1	1.043	1.086	1.129	1.171	1.214	1.257	1.3	1.214	1.129	1.043	0.957	0.871	0.786	0.7
ELEV.		4300	4400	4500	4600	4700	4800	4900	5000	5100	5200	5300	5400	5500	5600	5700	5800	5900	6000
TIME (MIN.)	STANDARD INTENSITY	INTENSITY-INCHES PER HOUR (ADJUSTED)																	
5	6.96	6.26	6.49	6.72	6.96	7.26	7.56	7.86	8.15	8.45	8.75	9.05	8.45	7.86	7.26	6.66	6.06	5.47	4.87
15	4.32	3.89	4.03	4.17	4.32	4.51	4.69	4.88	5.06	5.24	5.43	5.62	5.24	4.88	4.51	4.13	3.76	3.40	3.02
30	2.72	2.45	2.54	2.63	2.72	2.84	2.95	3.07	3.19	3.30	3.42	3.54	3.30	3.07	2.84	2.60	2.37	2.14	1.90
45	2.10	1.89	1.96	2.03	2.10	2.19	2.28	2.37	2.46	2.55	2.64	2.73	2.55	2.37	2.19	2.01	1.83	1.65	1.47
60	1.78	1.60	1.66	1.72	1.78	1.86	1.93	2.01	2.08	2.16	2.24	2.31	2.16	2.01	1.86	1.70	1.55	1.40	1.25
90	1.40	1.26	1.31	1.35	1.40	1.46	1.52	1.58	1.64	1.70	1.76	1.82	1.70	1.58	1.46	1.34	1.22	1.10	0.98
120	1.03	0.93	0.96	0.99	1.03	1.07	1.12	1.16	1.21	1.25	1.29	1.34	1.25	1.16	1.07	0.99	0.90	0.81	0.72
180	0.77	0.69	0.72	0.74	0.77	0.80	0.84	0.87	0.90	0.93	0.97	1.00	0.93	0.87	0.80	0.74	0.67	0.61	0.54
360	0.47	0.48	0.48	0.49	0.49	0.50	0.50	0.51	0.51	0.52	0.52	0.53	0.53	0.54	0.54	0.55	0.55	0.56	0.56
720	0.28	0.29	0.29	0.29	0.29	0.30	0.30	0.30	0.31	0.31	0.31	0.31	0.32	0.32	0.32	0.32	0.33	0.33	0.33
1440	0.16	0.16	0.16	0.17	0.17	0.17	0.17	0.17	0.17	0.18	0.18	0.18	0.18	0.18	0.18	0.19	0.19	0.19	0.19
2880	0.10	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.12	0.12	0.12	0.12	0.12
4320	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08

ADJUST. FACTOR FOR TIMES: 360 - 4320 MINUTES		1.02	1.03	1.04	1.05	1.06	1.07	1.08	1.09	1.1	1.107	1.118	1.13	1.14	1.15	1.16	1.17	1.184	1.195
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